Remarks

Reconsideration of this Application is respectfully requested.

Upon entry of the foregoing amendment, claims 1-44 are pending in the application, with 1, 6, 17, 23, 28 and 39 being the independent claims. Based on the following remarks, Applicants respectfully request that the Examiner reconsider all outstanding objections and rejections and that they be withdrawn.

Rejections Under 35 U.S.C. § 103

Claims 1-3 and 23-25

The Examiner has rejected claims 1-3 and 23-25 under 35 U.S.C. § 103(a) as being unpatentable over Marcellin *et al.*, "A Trellis-Searched 16 KBit/Sec Speech Coder with Low Delay," ADVANCES IN SPEECH CODING, dated March 5, 1992 ("Marcellin") in view of U.S. Patent No. 4,963,034 to Cuperman *et al.* ("Cuperman"). For the reasons set forth below, Applicants respectfully traverse.

Independent claim 1 is directed to "[a] method of performing an efficient excitation quantization of a prediction residual signal using a codebook in a speech or audio noise feedback coding (NFC) system, the NFC system including at least one noise feedback loop, the codebook including N vector quantization (VQ) codevectors, where N is an integer greater than one". The method includes the steps of:

> (a) deriving N correlation values using the NFC system, each of the N correlation values corresponding to a respective one of the N VQ codevectors;
>
> (b) combining each of the N correlation values with a corresponding one of N ZERO-STATE energies of the NFC system, thereby producing

> N minimization values each corresponding to a respective one of the N VQ codevectors; and
>
> (c) selecting a preferred one of the N VQ codevectors based on the N minimization values, whereby the preferred VQ codevector is usable as an excitation quantization of a prediction residual signal derived from a speech or audio signal.

The combination of Marcellin and Cuperman does not teach or suggest each and every feature of claim 1 as set forth above.

Marcellin is directed to a NFC structure that uses Trellis Coded Quantization (TCQ) to quantize a prediction residual. The Examiner cites Marcellin as teaching "a method for performing an efficient excitation quantization of a prediction residual using a codebook . . . the codebook including N vector quantization (VQ) codevectors" and "deriving N correlation values . . . each of the N correlation values corresponding to a respective one of the N VQ codevectors". *See* Office Action at pages 2-3. The Examiner has conceded that Marcellin does not teach any of the remaining features of claim 1. *See* Office Action at page 3.

However, Marcellin <u>teaches away</u> from the use of vector quantization in a speech coder, describing instead the use of a very different quantization scheme entitled Trellis coded quantization (TCQ) as an alternative to vector quantization. As stated in Marcellin:

> The means squared error (MSE) performance of TCQ is excellent. For encoding the memoryless uniform source, TCQ achieves a MSE within 0.21 dB of the distortion-rate function at all positive integral rates. This performance is better than that promised by the best lattices known in up to 24 dimensions [8]. ***In fact, evaluation of the asymptotic quantizer bound [9] indicates that no vector quantizer of dimension less than 69 can exceed the performance of TCQ for encoding the memoryless uniform source.***

See Marcellin, p. 47, second paragraph (emphasis added). Thus, since Marcellin teaches away from the using of vector quantization, it cannot possibly teach " a method for performing an efficient excitation quantization . . . using a codebook . . . *the codebook including N vector quantization (VQ) codevectors*" or " deriving N correlation values . . . *each of the N correlation values corresponding to a respective one of the N VQ codevectors*" as asserted by the Examiner.[1]

The foregoing deficencies of Marcellin with respect to claim 1 are not remedied by the teachings of Cuperman. Cuperman is directed to a coding structure that performs a Vector Quantizer (VQ) codebook search to code an input speech signal. However, the coding structure taught by Cuperman is not a Noise Feedback Coding (NFC) structure, as it does not use noise feedback filtering to shape coding noise. *See, e.g.,* specification of the present application at paragraph [0014] ("One type of predictive coding is Noise Feedback Coding (NFC), wherein noise feedback filtering is used to shape coding noise, in order to improve a perceptual quality of quantized speech."). Thus, Cuperman cannot teach or suggest "[a] method of performing an efficient excitation quantization of a prediction residual signal using a codebook *in a speech or audio noise feedback coding (NFC) system, the NFC system including at least one noise feedback loop*" or "deriving N correlation values *using the NFC system*, each of the N correlation values corresponding to a respective one of the N VQ codevectors" as recited by claim 1.

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[1] In particular, the Examiner asserts that the recited step of "deriving N correlation values using the NFC system, each of the N correlation values corresponding to a respective one of the N VQ codevectors" is taught by Marcellin at page 48, paragraphs 1-3, which the Examiner states describes "providing both long term and short term prediction coefficients within a waveform coding structure, where the coefficients are used to construct the residual to be transmitted." *See* Office Action at p. 3. Even if this characterization of the teachings of Marcellin is accurate, Marcellin does <u>not</u> teach providing a different set of short term and long term prediction coefficients for *each codevector in a VQ codebook*, and therefore these prediction coefficients cannot be the recited "correlation values" of claim 1.

Furthermore, Cuperman nowhere teaches or suggests deriving N ZERO-STATE energies of an NFC system, a feature which the Examiner has conceded is nowhere found in Marcellin. Although Cuperman does teach decomposing vectors representing predicted speech (denoted y(n)) and reconstructed speech (denoted z(n)) into zero-input response and zero-state response components (*see* equations (15)-(18) at column 8 of Cuperman), the energies associated with these components are <u>never</u> derived. Rather, Cuperman first uses these components to produce a reconstruction error (*see* Cuperman, col. 8, lines 45-67), and then squares the reconstruction error to derive an energy associated with the reconstruction error alone (*see* Cuperman, col. 4, lines 43-59). In Cuperman, "reconstruction error" is defined as the difference between input speech (denoted x(n)) and reconstructed speech z(n).

Because Marcellin and Cuperman, either alone or in combination, do not teach or suggest each and every element of claim 1, these references cannot render claim 1 obvious. Likewise, these references cannot render dependent claims 2 or 3 obvious for the same reasons as independent claim 1 from which they depend and further in view of their own respective features. Accordingly, Applicants respectfully request that the rejection of claims 1-3 under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

Independent claim 23 is directed to a "computer program product comprising a computer usable medium having computer readable program code means embodied in the medium for causing an application program to execute on a computer processor to perform" essentially the same method steps as are recited in independent claim 1. Therefore, the arguments presented above regarding why the combination of Marcellin and Cuperman does not render obvious independent claim 1 apply with equal force to

independent claim 23. Dependent claims 24 and 25 are likewise not rendered obvious by Marcellin and Cuperman for the same reasons as independent claim 23 from which they depend and further in view of their own respective features. Accordingly, Applicants respectfully request that the rejection of claims 23-25 under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

Claims 6, 8-13, 28 and 30-35

The Examiner has rejected claims 6, 8-13, 28 and 30-35 under 35 U.S.C. § 103(a) as being unpatentable over Cuperman in view of U.S. Patent No. 6,141,640 to Moo ("Moo"). For the reasons set forth below, Applicants respectfully traverse.

Independent claim 6 is directed to "[a] method of searching a codebook in a speech or audio coding system, the codebook including a plurality of shape codevectors each associated with a positive codevector and a negative codevector." The method includes the steps of:

> (a) deriving a correlation term corresponding to one shape codevector by correlating a ZERO-STATE response of the coding system corresponding to the shape codevector, with a ZERO-INPUT response of the coding system;
>
> (b) deriving a first minimization value corresponding to the positive codevector associated with the one shape codevector when a sign of the correlation term is a first value; and
>
> (c) deriving a second minimization value corresponding to the negative codevector associated with the one shape codevector when the sign of the correlation term is a second value.

The combination of Cuperman and Moo does not teach or suggest each and every feature of claim 1 as set forth above.

The Examiner has conceded that Cuperman does not teach or suggest "deriving a first minimization value corresponding to the positive codevector associated with the one

shape codevector when a sign of the correlation term is a first value" or "deriving a second minimization value corresponding to the negative codevector associated with the one shape codevector when the sign of the correlation term is a second value" as recited in claim 6. These features are also not taught or described by Moo.

Moo is directed to a digital transmitter/receiver communications system that transmits audio voice signals over a channel. In Moo, error vectors J associated with encoding Line Spectral Frequency (LSF) coefficients are modeled by a number of vectors J_p having all positive components, and a sign vector s indicating the polarity of each component of the vector. An index I_p of the positive vector J_p and the sign vector s corresponding to vector J are transmitted, along with other audio information, to a receiver decoder.

The Examiner has apparently equated the approximation of each error vector J by a positive vector J_p and a sign vector s, as taught by Moo, with the recited steps of "deriving a first minimization value corresponding to the positive codevector associated with the one shape codevector when a sign of the correlation term is a first value" and "deriving a second minimization value corresponding to the negative codevector associated with the one shape codevector when the sign of the correlation term is a second value".

Applicants respectfully submit that this is incorrect. Claim 6 recites the use of a signed codebook in which there is a "plurality of shape codevectors", each of which is associated with "a positive codevector and a negative codevector". An example of such a codebook is described at paragraphs [0300]-[0301] of the specification of the present application:

> In a signed codebook the code vectors are related in pairs, where the two code vectors in a pair only differ by the sign of the vector elements, i.e., a first and second code vector in a pair, c1 and c2, respectively, are related by
>
> $$c_1(k) = -c_2(k), \text{ for } k=1,2,\ldots,K \qquad (13)$$
>
> where K is the dimension of the vectors. Consequently, for a codebook of N codevectors $N/2$ linear independent codevectors exist. The remaining $N/2$ codevectors are given by negating the $N/2$ linear independent codevectors as in Eq. 13. . . . It is only necessary to store the $N/2$ linear independent codevectors as the remaining $N/2$ codevectors are easily generated by simple negation.

Moo does not teach or suggest the use of such a codebook in which a "shape codevector" is associated with both a "positive codevector and a negative codevector". Consequently, there is no way that Moo could teach or suggest "deriving a first minimization value corresponding to *the positive codevector associated with the one shape codevector* when a sign of the correlation term is a first value" or "deriving a second minimization value corresponding to *the negative codevector associated with the one shape codevector* when the sign of the correlation term is a second value." Contrary to the assertion of the Examiner, Moo's description of creating a sign vector s that indicates the polarity of each component of an error vector J simply does not teach or suggest these features.

Because Cuperman and Moo, either alone or in combination, do not teach or suggest each and every element of claim 6, these references cannot render claim 6 obvious. Likewise, these references cannot render dependent claims 8-13 obvious for the same reasons as independent claim 6 from which they depend and further in view of their own respective features. Accordingly, Applicants respectfully request that the rejection of claims 6 and 8-13 under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

Independent claim 28 is directed to a "computer program product comprising a computer usable medium having computer readable program code means embodied in

the medium for causing an application program to execute on a computer processor to perform" essentially the same method steps as are recited in independent claim 6. Therefore, the arguments presented above regarding why the combination of Cuperman and Moo does not render obvious independent claim 6 apply with equal force to independent claim 28. Dependent claims 30-35 are likewise not rendered obvious by Cuperman and Moo for the same reasons as independent claim 28 from which they depend and further in view of their own respective features. Accordingly, Applicants respectfully request that the rejection of claims 28 and 30-35 under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

Claims 7 and 29

The Examiner has rejected claims 7 and 29 under 35 U.S.C. § 103(a) as being unpatentable over Cuperman in view of Moo as applied to claims 6 and 28 and further in view of Marcellin. As described above with respect to independent claims 6 and 28, neither Cuperman nor Moo teach or suggest "deriving a first minimization value corresponding to the positive codevector associated with the one shape codevector when a sign of the correlation term is a first value" or "deriving a second minimization value corresponding to the negative codevector associated with the one shape codevector when the sign of the correlation term is a second value". Marcellin likewise nowhere teaches or suggests these features. Consequently, the combination of Cuperman, Moo and Marcellin does not render obvious independent claims 6 and 28. Likewise, this combination does not render obvious dependent claims 7 and 29 for the same reasons as independent claims 6 and 28 from which they respectively depend, and further in view of

their own respective features. Consequently, Applicants respectfully request that the rejection of claims 7 and 29 under 35 U.S.C. §103(a) be reconsidered and withdrawn.

Claims 17 and 39

The Examiner has rejected claims 17 and 39 under 35 U.S.C. § 103(a) as being unpatentable over Marcellin in view of Moo. For the reasons set forth below, Applicants respectfully traverse.

Independent claim 17 is directed to "[a] method of searching a codebook in a speech or audio noise feedback coding (NFC) system, the NFC system including at least one noise feedback loop, the codebook including a plurality of shape codevectors each associated with a positive codevector and a negative codevector." The method includes the steps of:

for each shape codevector

> (a) deriving a correlation term corresponding to the shape codevector using at least one filter structure of the NFC system;
>
> (b) deriving a first minimization value corresponding to the positive codevector associated with the shape codevector when a sign of the correlation term is a first value; and
>
> (c) deriving a second minimization value corresponding to the negative codevector associated with the shape codevector when a sign of the correlation term is a second value; and

(d) selecting a preferred codevector from among the positive and negative codevectors corresponding to minimization values derived in steps (b) and (c) based on the minimization values.

The combination of Marcellin and Moo does not teach or suggest each and every feature of claim 17 as set forth above.

The Examiner has conceded that Marcellin does not teach or suggest "deriving a first minimization value corresponding to the positive codevector associated with the

shape codevector when a sign of the correlation term is a first value" or "deriving a second minimization value corresponding to the negative codevector associated with the shape codevector when the sign of the correlation term is a second value" as recited in claim 17. As explained above in reference to independent claims 6 and 28, these features are also not taught or described by Moo.

Because Marcellin and Moo, either alone or in combination, do not teach or suggest each and every element of claim 17, these references cannot render claim 17 obvious. Accordingly, Applicants respectfully request that the rejection of claim 17 under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

Independent claim 39 is directed to a "computer program product comprising a computer usable medium having computer readable program code means embodied in the medium for causing an application program to execute on a computer processor to perform" essentially the same method steps as are recited in independent claim 17. Therefore, the arguments presented above regarding why the combination of Marcellin and Moo does not render obvious independent claim 17 apply with equal force to independent claim 39. Accordingly, Applicants respectfully request that the rejection of claim 39 under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

Claims 18-20 and 40-42

The Examiner has rejected claims 18-20 and 40-42 under 35 U.S.C. § 103(a) as being unpatentable over Marcellin in view of Moo as applied to claims 17 and 39 and further in view of Cuperman. As described above with respect to independent claims 17 and 39, neither Marcellin nor Moo teach or suggest "deriving a first minimization value corresponding to the positive codevector associated with the shape codevector when a

sign of the correlation term is a first value" or "deriving a second minimization value corresponding to the negative codevector associated with the shape codevector when the sign of the correlation term is a second value". Cuperman likewise nowhere teaches or suggests these features. Consequently, the combination of Marcellin, Moo and Cuperman does not render obvious independent claims 17 and 39. Likewise, this combination does not render obvious dependent claims 18-20 and 40-42 for the same reasons as independent claims 17 and 39 from which they respectively depend, and further in view of their own respective features. Consequently, Applicants respectfully request that the rejection of claims 18-20 and 40-42 under 35 U.S.C. §103(a) be reconsidered and withdrawn.

Claim Objections

The Examiner has objected to claims 4, 5, 14-16, 21, 22, 26, 27, 36-38, 43 and 44 as being dependent upon a rejected base claim. For the reasons set forth above, the rejections of the base claims have been traversed. Accordingly, Applicants respectfully request that the objection to claims 4, 5, 14-16, 21, 22, 26, 27, 36-38, 43 and 44 be reconsidered and withdrawn.

Conclusion

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. Applicants believe that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment and Reply is respectfully requested.

Respectfully submitted,

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